

**Remarks**

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendments, claims 1-5 and 7 are pending in the application, with claim 1 being the independent claim. Claims 6 and 8-14 are sought to be cancelled without prejudice to or disclaimer of the subject matter therein. Claims 1, 5 and 7 are sought to be amended. Support for the amendments to claim 1 can be found at, *inter alia*, ¶[0011] and ¶[0033], and FIGs. 4 and 5 of the as-filed specification. Claims 5 and 7 are amended to more clearly define the present invention. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendments and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

**I.      *Claim Objections***

Claims 6 and 13 were objected to for allegedly using inappropriate terminology. The Examiner alleged that the term "open-structured transition metal" does not limit the type of metal oxide, and will be interpreted as a metal oxide created by the method of claims 1 or 8 to have an open or porous structure. The Examiner further alleged that the term "transition metal" is logically inconsistent with claims 7 and 14, which list a series of metals that include non-transition metals.

This objection is respectfully traversed.

Claims 6 and 13 have canceled without prejudice to or disclaimer of the subject matter therein. Thus, the objections to these claims have been rendered moot. Claim 5

has been amended to recite a metal oxide comprising a metal having an open structure.

(*See* claim 5, *supra*.) Applicants assert that the claim term "a metal oxide having an open structure" is not ambiguous, and is defined in as-filed specification as "metal oxides having a crystalline structure in which relatively many pores are formed, unlike compact crystalline structures." (*See* ¶[0011] of the as-filed specification.) Thus, "a metal oxide having an open structure" refers to a crystalline metal oxide that is porous.

Upon consideration of the above remarks, Applicants respectfully request that the objections to claims 6 and 13 be withdrawn.

***II. Rejections under 35 U.S.C. § 112, Second Paragraph***

Claims 7 and 14 were rejected under 35 U.S.C. § 112, Second Paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Specifically, the Examiner alleged that the metals silicon and aluminum, which are recited in claims 7 and 14, are not "transition metal oxides" as recited in claims 6 and 13, respectively, from which claims 7 and 14 depend.

Applicants respectfully traverse this rejection.

Solely to facilitate prosecution of this application, claims 5 and 7 have been amended to more fully describe the present invention. Amended claim 7 now depends from amended claim 5, which more clearly provides antecedent basis for the terms "metal oxide," including oxides of tantalum, silicon and aluminum. Claim 14 is sought to be cancelled without prejudice to or disclaimer of the subject matter therein.

Upon consideration of the above remarks, Applicants respectfully request that the rejections under 35 U.S.C. § 112, Second Paragraph, with respect to claims 7 and 14 be withdrawn.

### ***III. Legal Principles***

#### ***A. Rejections Under 35 U.S.C. § 102***

Under 35 U.S.C. § 102, a claim can only be anticipated if every element in the claim is expressly or inherently disclosed in a single prior art reference. *See Kalman v. Kimberly Clark Corp.*, 713 F.2d 760, 711 (Fed.Cir. 1983), *cert. denied*, 465 U.S. 1026 (1984).

#### ***B. Rejections Under 35 U.S.C. § 103***

The Examiner bears the burden of establishing a *prima facie* case of obviousness based upon the cited art. *See In re Piasecki*, 745 F.2d 1468, 1471-72 (Fed. Cir. 1984). The Examiner must show reasons, explicit or otherwise, that would compel one of ordinary skill to combine the cited references in order to make and use the claimed invention. To determine whether there is "an apparent reason to combine" the known elements in the way a patent claims,

it will be necessary . . . to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art . . . . To facilitate review, this analysis should be made explicit.

*KSR Int'l Co. v. Teleflex Inc.*, No. 04-1350, 2007 U.S. LEXIS 4745, at \*9-10 (U.S. April 30, 2007); *see also* Memorandum from the United States Patent and Trademark Office,

"Supreme Court decision on *KSR Int'l Co. v. Teleflex Inc.*," (May 3, 2007) ("The Court did not totally reject the use of 'teaching, suggestion, or motivation' as a factor in the obviousness analysis . . . . [I]n formulating a rejection . . . based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed.").

A prior art reference must be considered in its entirety, including portions that would lead away from the claimed invention. *See M.P.E.P. § 2141.02(VI)* (citing *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Cir. 1983)); *see also Panduit Corp. v. Dennison Mfg. Co.*, 774 F.2d 1082, 1093-94 (Fed. Cir. 1985) ("The well established rule of law is that each prior art reference must be evaluated as an entirety . . . ."). "There is no suggestion to combine . . . if a reference teaches away from its combination with another source." *Tec Air, Inc. v. Denso Manufacturing Michigan Inc.*, 192 F.3d 1353, 1360 (Fed. Cir. 1999); *see also KSR*, U.S. LEXIS 4745 at \*34 (reaffirming "the corollary principle that when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious") (citing *United States v. Adams*, 383 U.S. 39, 51-52 (1966)). "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant . . . ." *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994) (*emphasis added*).

**IV. Rejection under 35 U.S.C. § 102(b) over Park as evidenced by Gogova**

Claims 1, 2, 5, 6, 8, 9, 12 and 13 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Park *et al.*, "Pt-WO<sub>x</sub> electrode structure for thin-film fuel cells," *Appl. Phys. Lett.* 81:907-909 (2002) ("Park"). The Examiner alleged that Park discloses a method for preparing a counter electrode that comprises co-sputtering platinum and a metal oxide onto a substrate (e.g., indium tin oxide-coated glass). The Examiner further alleged that the amorphous metal oxide counter electrode disclosed by Park is similar to the presently claimed amorphous metal oxide electrode. However, the Examiner conceded that Park does not disclose an electrode for a dye-sensitized solar cell. (Office Action, at p. 4, ll. 9-13.) With respect to claim 2, the Examiner alleged that the metal oxides disclosed by Park have a refractive index of 2 or higher, as evidenced by Gogova *et al.*, "Structural and Optical Properties of CVD Thin Tungsten Oxide Films," *Physica Status Solidi (A)* 176:969-984 (1999) ("Gogova"). With respect to claim 5, the Examiner alleged that the metal oxide disclosed by Park has an open, porous structure. With respect to claim 6, the Examiner alleged that the metal oxide disclosed by Park contains the element tungsten, which is a transition metal.

Applicants respectfully traverse this rejection.

The presently claimed invention requires fabricating a counter electrode for a dye-sensitized solar cell comprising co-sputtering platinum and a metal oxide as target materials onto a substrate to form a counter electrode having a non-layered structure, and *contacting the surface of the counter electrode with a light-absorbing dye*. Park discloses a method of producing a counter electrode by co-sputtering platinum and a metal oxide onto a substrate. However, Park does not teach or suggest contacting the

counter electrode with a light-absorbing dye to form a counter electrode for a dye sensitized solar cell. Because Park does not recite each and every element of claim 1, Park does not anticipate claim 1. Claims 2, 5 and 6 depend from claim 1, and incorporate all of the elements of claim 1, and therefore are also not anticipated by Park. Claims 8, 9, 12 and 13 have been canceled without disclaimer of the subject matter therein.

Applicants respectfully request that the rejection of claims 1, 2, 5, 6, 8, 9, 12 and 13 under 35 U.S.C. § 102(b) over Park be withdrawn.

*V. Rejections under 35 U.S.C. § 103*

Claims 1, 6-8, 13 and 14 were rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Pruneanu *et al.*, "Nanoporous Al<sub>2</sub>O<sub>3</sub> Membranes filled by Platinum," *Semiconductor Conf. Proc., CAS 2000 Proc., Int'l* 2:475-478 (2000) ("Pruneanu"), in view of Park. The Examiner alleged that Pruneanu discloses a method for preparing an Al<sub>2</sub>O<sub>3</sub>/Pt composite electrode for electronic and photoelectronic devices such as dye-sensitized solar cells. The Examiner conceded that Pruneanu fails to disclose a method of forming a counter electrode by sputtering. However, the Examiner alleged that it would have been obvious to one of ordinary skill in the art to modify the method of Pruneanu for creating Al<sub>2</sub>O<sub>3</sub>/Pf electrodes by utilizing the sputtering method of Park in order to improve the physical and electrochemical properties of the electrodes. (Office Action, at p. 6, ll. 19-22.)

Claims 3, 4, 10 and 11 were rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Park in view of Vink *et al.*, "On the Homogeneity of Sputter-Deposited

ITO Films Part I. Stress and Microstructure," *Thin Solid Films* 266:145-151 (1995)

("Vink"). The Examiner alleged that Vink discloses a sputtering method that uses two metal-oxide targets that would be compatible with the method disclosed by Park for sputter-depositing films for use in optoelectronic applications such as transparent conductors.

Applicants respectfully traverse these rejections.

Claim 1 requires fabricating a counter electrode for a dye-sensitized solar cell comprising co-sputtering platinum and a metal oxide as target materials onto a substrate to form a counter electrode, and *contacting the surface of the counter electrode with a light-absorbing dye*. Pruneanu discloses an electrochemical method for fabricating electrodes that results in electrodes having a porous structure. (Pruneanu, at p. 476, Fig. 1.) Pruneanu discloses that the electrodes would be suitable for use as photoelectronic devices, but does not disclose that the electrodes would be suitable for use in dye-sensitized solar cells. (*Id.*, at p. 475, col. 1.) Moreover, Pruneanu does not disclose contacting the surface of a counter electrode with a light-absorbing dye. As described above, Park discloses a method of producing a counter electrode by co-sputtering platinum and a metal oxide onto a substrate. However, Park also does not teach or suggest contacting the counter electrode with a light-absorbing dye to form a counter electrode for a dye sensitized solar cell. Therefore, Pruneanu fails to remedy the deficiencies of Park because Pruneanu fails to teach a method whereby a counter electrode is contacted with a light-absorbing dye as the presently claimed invention requires.

Furthermore, the dye sensitized electrodes of the presently claimed invention have a non-layered structure. (*See* claim 1, *supra*.) Conversely, the electrodes of Pruneanu clearly have a layered structure. (*See* Pruneanu, at p. 476, Fig. 1 and p. 477, Fig. 4.) The Examiner has alleged that a person of ordinary skill would have reason to prepare the electrodes of Pruneanu using the method of Park. However, the Examiner has provided no showing that the electrode structure taught by Pruneanu could be formed using the method of Park. Furthermore, even if a person of ordinary skill were to successfully form an electrode as taught by Pruneanu using the method of Park, such an electrode would fail to provide a dye-sensitized electrode having a non-layered structure, as is required by the presently claimed invention. Therefore, the combination of Pruneanu and Park do not teach or suggest each and every element of claim 1, and does not render claim 1 obvious. Because claims 3, 4 and 7 depend from claim 1, and each element of claim 1 is incorporated into these claims, these claims are also not obvious in view of the cited references. Claims 6, 8, 10, 11, 13 and 14 have been canceled without disclaimer to the subject matter therein.

Upon consideration of the above remarks, Applicants respectfully request that the rejection of claims 1, 3, 4 and 7 under 35 U.S.C. § 103(a) over Pruneanu in view of Park be withdrawn.

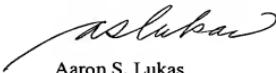
***Conclusion***

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

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